Project Pothole

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GitLab Link

https://gitlab.com/ihughes2/cs-545-project-pothole

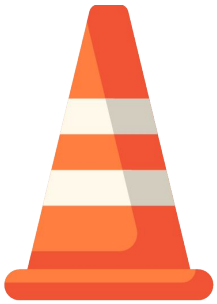
Link to our GitLab including ReadMes, picture folders, all code, and commit versions.

Description

- Online survey style submission to report potholes to be filled
- Our service extends to a physical business filling potholes via responding to these reports
- Our users will input important data such as the potholes location, a size estimation, the date of submission, and other comments and concerns relating to the relevant pothole.

The goal of Project Pothole is to ensure the safety of drivers within the area. Our department was created to help the average working American. Our pothole fixing website would mainly affect people who drive or commute often. Potholes are not only a significant nuisance to drivers, but can even lead to accidents, damaged vehicles, or injured drivers. They are something that do not receive enough attention from the government in proportion to the frustration and danger they cause on the road. We aim to enable the public to help fix the problem by identifying the most problematic potholes, so that even in the case of limited resources, they are still being fixed efficiently and in a timely manner.

Targeted E - Efficiency



Our primary E that we are trying to improve upon is "Efficiency". We want the main focus of our website to be that potholes can be reported and fixed in a timely manner. The key need we are focusing upon is our operational speed. We want to ensure that the data received by our website is organized and processed efficiently in order to provide noticeable results in towns or cities.

Our entire plan for Project Pothole was to make the website efficient in its tasks and easy for anyone to use. As stated above, we want to ensure that all potholes are reported and fixed in a timely manner. This is why we picked Efficiency as our Primary E.

Gauging Improvement to E

The way we are monitoring improvements to our targeted E, efficiency, is through user submission. Suffice that our service works and we did repair potholes, our efficiency would be monitored by examining the time it took for a team to respond to a report, and the users would see that the pothole has been fixed in a shorter period than normal. Because our service is not yet functional, we are instead measuring our efficiency by the time it takes for a user to submit a detailed report of a pothole. By reducing the time it takes for the ticket to be submitted we are able to more efficiently tend to the potholes.

Since efficiency is our main target, we want to make sure that a user only has to take small amount of steps to complete their report. Our report page is simple and straightforward, and enters a user's pothole data into the database as soon as they hit the submit button. It also directs them to the database so they can ensure that the report has made it a place which can be seen. While there are other tabs of our website that allow users to learn more about the creators, it has a tab bar at the top to allow users to easily navigate the website without struggle. We also ensured that the main focus of our website was not hindered by menial FAQs and social media links, like on the NYCDOT reporting website.

Persona

- Kevin FakeNamey:
  - Age: 30
  - Daily Commutes To and From NYC
  - Fears about his morning commute
    - bad potholes on the road,
    - many of his coworkers have gotten into accidents due to road conditions
  - Consistently reports potholes to NYC DoT to try and ensure a safer work commute
  - His coworkers and him can be heard constantly asking: **“When will there be a better system?”**

Here is some of the data we based our persona/demographic off of:

https://www.livestories.com/statistics/new-york/transportation-commute- 5.5 million people over the age of 16 commute in New York City by car, truck, van, or taxi every single day from a report done in 2018. We can see that a vast number of people are constantly commuting into the city on a daily basis.

https://data.cityofnewyork.us/Social-Services/Pothole-Map/wr97-8arm - By analyzing the recent pothole data, around 5 to 6 potholes are reported every single day. Many are actually reported several times with a status of “Pending”. NYC DoT also does not provide information on the timeline of when potholes will be fixed. This lets us know that the time for potholes to be fixed does not keep up with the demand according to the number of potholes.

https://www.diamondinjurylaw.com/blog/2018/02/28/nyc-pothole-problem/ - In 2017, there were approximately 60,712 total complaints regarding potholes. Most of these arose as street condition complaints, although there were reports of potholes on bridges and highways too. The average pothole fixing time takes around 3-4 days for all boroughs, and a few days longer on the bridge, as traffic flow hinders the ability to fix the roads.

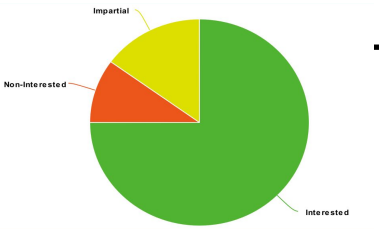
https://www.cbsnews.com/newyork/news/aaa-new-york-potholes-car-damage/ - In 2021, every 1 in 10 drivers who hit a pothole sustained significant car damage that costed an upwards of $600. AAA also reported that they responded to 135,000 calls

for roadside assistance alongside the bridge to NYC or inside of NYC, and the top reason for service was flat tires due to potholes.

Our Demographic

Our targeted audience consists of any middle-aged driver in Hoboken who is commuting into the city on a daily or semi-daily basis. This is because people who are concerned about potholes the most are dealing with them on a daily basis.

Cities are known for their dense population. As Hoboken residents, we have seen the amount of cars and bikers that are on our roads daily. Our website's goal is to reach the working class Hoboken residents that utilize the roads for their daily commutes. By targeting this demographic for our website, we can advertise ourselves better among a community of people who are concerned for their vehicle's safety, as well as their own safety.



Our Initial Survey

We put out a survey to gauge interest, here are the results:

- Given a total of 32 Responses, 16 of which were actively commuting from Hoboken, and 75% saw an interest in this kind of service
- 15% of the non-interested population commented on a lack of potholes in the City already
- The 75% group complained of some troublesome potholes around Hoboken/within NYC

The survey was distributed using Google Forms

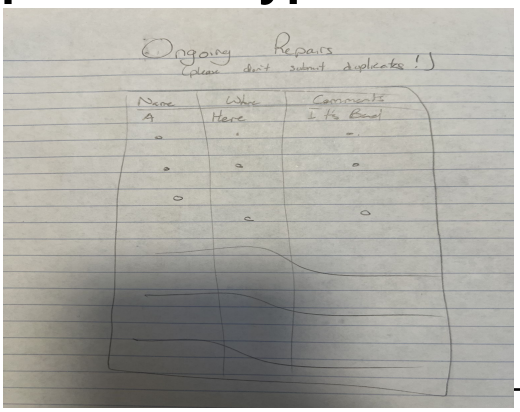
Our original Google Forms poll asked Hoboken residents whether or not they commuted to the city on a daily basis. Of the 32 people surveyed, 16 were commuting regularly. As Hoboken is a place where residents commute from often, we want to make sure that we see data from the demographic of those who do not commute as well. Our 8 participants that were not regularly commuting shed light on the fact that there are not many potholes in the mile square already. Since they are not commuting as often, is it understandable to think there is not many potholes, as they may not run into them as often as someone who drives daily. Overall, 24/32 participants were interested in our services and stated generally that this service would be a great quality of life improvement for everyone inside and outside the city, as potholes being fixed faster means less damage to personal property.

Users for Website Feedback

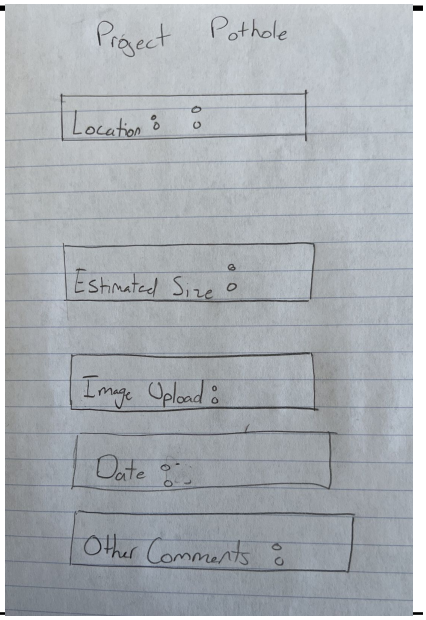
In each iteration, those who tested the website were family members, ranging from 17-75 years old. We made sure to use this age group, as they are the ones most often commuting to the city. We also chose this age group to ensure that users of different ages could comment on the different aspects of usability on the website.

Among those tested were younger/older siblings, parents, and grandparents. All of the family members interviewed commute into the city on a semi-daily to daily basis for school and work. At least two of the testers are also partially color-blind, which helped us to see if the colors of the website were viable for all users.

First Design
Paper Prototype



User data fields to fill out



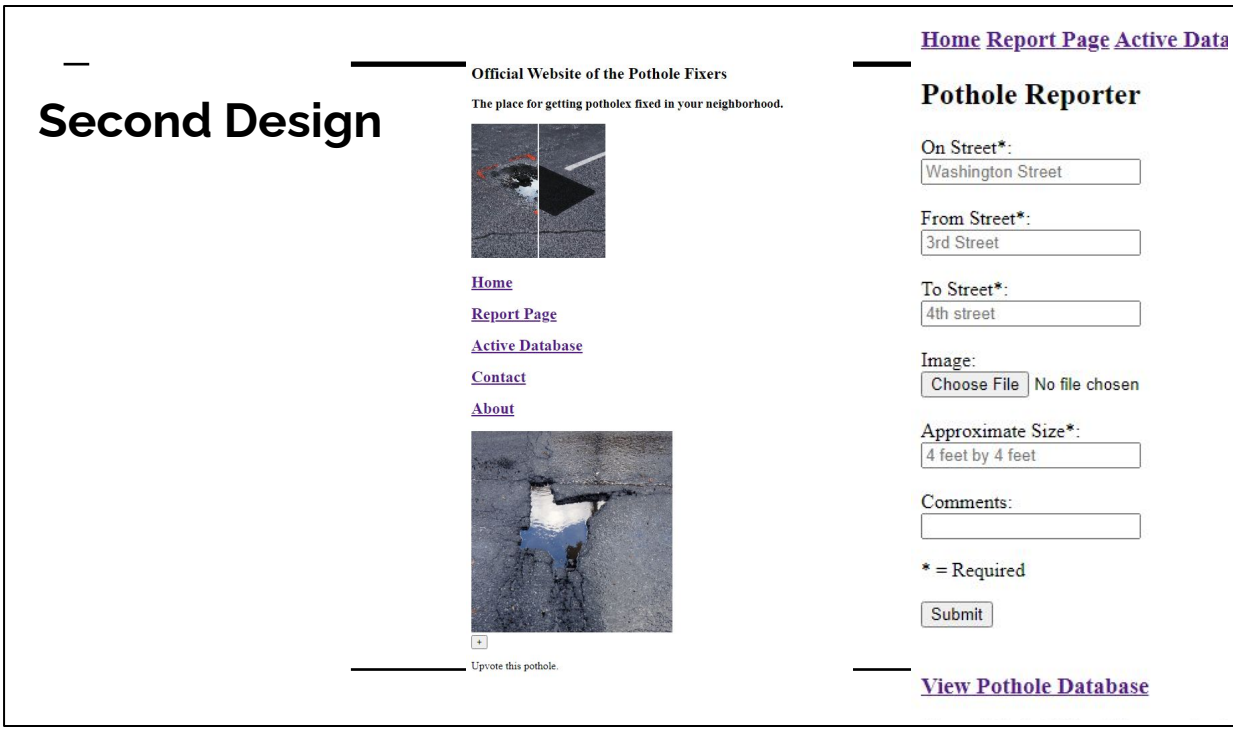
Our rough draft of our website was pretty basic. We were mostly focused on the report page where we would figure out which user inputs were necessary. This was so the user could easily fill out their pothole information in an efficient time. We first considered the user inputting location, estimated size of pothole, an image of it, and the date and any comments. We have since reduced the amount of inputs due to look and user feedback. Other inputs were further clarified, as “Location” is very general and does not give a good marker on where the pothole is actually located. Further with the progression of this prototype, all the information would be stored in a database like table which would correlate to the filled out data fields.

User Feedback - First Design

- Should it keep track of who submitted?
- Can a more 'approximate' location be specified?
- Is having comments necessary?

For our first point, we decided that the person who submitted a pothole may be dangerous information to report. By keeping all reports in the active database anonymous, we can better protect those who visit our website. For the second point, we believe that a more approximate location can be specified. By having 1 user input be the "Location", it makes it very vague as to what we as a company are looking for. Are we searching for an address, street, or something else? To make this location more precise for users, we added "On Street", "To Street", and "From Street" to ensure that we get the approximate location of the pothole. Lastly, we believe that comments are necessary to just in case there is additional information that a user would like to report. The field for comments will not be mandatory though, as we feel some users might not see a need to add comments.

Second Design



For the second design we started to make more of a website layout, adding a Homepage, Database page, Contact page, and “About Us” page. Some main changes with the report page from out first design was that we realized we needed the user to be more specific with the location of the pothole. Using the New York pothole report website, we were able to see different ways a user could mark the location of a pothole. We decided to have 3 inputs for the location, so we may know which street the pothole is on, and which two streets it is between. This was mainly because of the way the streets are designed in block patterns. This way of inputting location works all areas of Hoboken and NYC. We also removed the “date of submission” input, figuring we can utilize Javascript to grab that information ourselves. Lastly, we also added an Upvote/Downvote feature on the Homepage so other users could upvote on potholes they are also having trouble with.

Second Design Cont.

Home Report Page Active Database Contact About

Active Reports Database

Location	Picture	Size Estimate	Comments	Date Posted
Washington St., 3rd St., 4th St.		4ft by 4ft	This pothole is really bothering me. Every day I drive on Washington to drop my kids off at school and always have to avoid this pothole! Kinda looks like Texas though!	2022-010-31 15:00

Cont.

User Feedback - Second Design

- Pictures are a bit redundant
  - Pictures were not needed as approximate location was given
- Upvote pothole seemed unnecessary
- When you submit a pothole, it does not automatically enter the database
- Website is a little bland and hard to navigate
  - The home bar is not consistent on all pages
  - Too much information with not enough layout
  - Website was hard on the eyes

From our second round of feedback, we got a few more requests. For our first request, we noticed that asking users to submit pictures was difficult for two reasons. The first reason is that we were already provided with the approximate location of the pothole, so finding it in a smaller area wouldn't be too difficult. The second reason is that some people were uploading pictures from their laptops and others from their phones, so some of the images do not display properly after they become resized in the database. Therefore we are opting to remove the photo option from the website. Alongside that, we are also opting to remove the upvote pothole as it seems unnecessary and has the same image issue that we ran into in the database. The third piece of feedback we received deals with the pothole not actually entering the database. We have improved upon the Javascript code we were previously using, and can ensure than whenever the form is completed, it automatically enters the database. Our last piece of feedback was that our website did not look nice and was hard on the eyes. By implementing CSS and a uniform taskbar on all website pages, we tested with colorblind users that they could indicate the differences between the colors and could navigate it easily.

Final Design

Pothole Reporter

On Street*:
Washington Street

From Street*:
3rd Street

To Street*:
4th Street

Approximate Size*:
4 feet by 4 feet

Additional Comments:

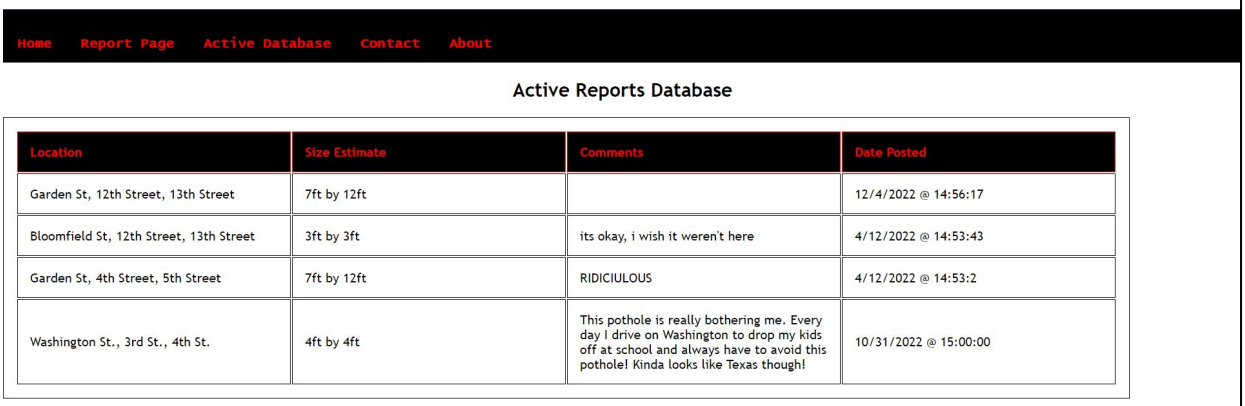
* = Required

Submit

View Pothole Database

Now we have arrived at the final design of our website. We have removed the upvoting system and the option to add images onto a slide. There is also the uniform taskbar at the top of every page. Our pages are now styled with CSS and are much nicer to look at as well. The next slide shows our database.

Final Design Cont.



Here is our final design for our report database. We compile the locations given from the form into one location spot. We also have a category for size and comments, and comments will show up blank if a user did not have any comments about their pothole. Lastly, we utilized Javascript to get the date and time that a pothole is reported. On the next slide, there is an example video of how reporting a pothole looks.

Demo video! Provided here if you cannot view from the slides: https://drive.google.com/file/d/1gQn1fZSZSbJecncaZ2eOIMguXgmq74r9/view?resourcekey

We first head to the report page and input a pothole. After we submit it, it does straight into the database and takes us to the database page. We then view our other two Contact and Information pages just as additional things to our website. Then we head back and report a second pothole on the website. As can be seen, both the previous pothole and the new one are in the database with the corresponding times they were reported at.

PAR Review

Perception

- Sections of the website with similar purposes are put on the same page

Attention

- How well does the website grab a user's focus.

Retention:

- How easy is it for a user to use our website, and if the ability to use it is retained in a user's memory.

Perception: Since our project has covers two different major areas, reporting potholes and seeing the pothole report database, we have made sure to not let the two be on the same page, to avoid confusion. One website area is primarily for reporting potholes. The other area is just for viewing the reports. By having them on separate pages, and having each section of the website in a task bar, we have ensured that our website has well rounded perception.

Attention: When users come to our website, they have an intention. This would be either to check on pothole status, or to report a pothole. This means that users coming to our website will be able to focus on what they are intending to look at and achieve it quickly. While there are other information tabs on our website, it is up to the user whether they would like to contact us or learn more about our initiative.

Retention: Because our website is very straightforward, retention will be easy because there should be no confusion of how to use the website. Our users should be able to look at it for the first time and understand where to go, and can continually come back and remember as well. Reporting a pothole is easy because we provide examples on how to fill out the form accurately to give the best results from our repair. The task bar at the top of the screen also helps users to know the layout of the website easily.

Simplicity Review

- Time
  - When decreasing the amount of time needed for a task, it makes the task feel less complex
  - Decreasing the time between opening the app and reporting the pothole is the best way to enhance simplicity
    - To do this, we decreased the amount of steps needed to submit a pothole
  - Made the menu the first thing to load on the page
    - All important links are put front and center meaning the user can find them quicker

The main principle of simplicity we focused on is time. Our project is a pothole reporting service which will allow the public of different areas to report potholes for them to be fixed in real time. When driving anywhere, the biggest problems on the road are traffic and potholes. Out of the 33,000 traffic fatalities a year, about 1/3 of them are caused by the poor condition of the roads. To ensure simplicity, we made the process of reporting potholes as streamlined as possible. This was tested by checking the time it took a beta tester to report a pothole after opening the website. The biggest reducer to time was removing the required image which saved time it both its uploading time and the time it took to take the actual picture.

Accessibility Review

- Due to the high Contrast between colors, issues such as colorblindness are not a problem when navigating the website
- We based our functionality off of this site
  - https://a841-dotvweb01.nyc.gov/potholeform/ViewController/CreateComplaint.aspx
- We kept Fitt's Law in mind while designing the Website
- We removed photos to make this functional as an App in the future

The Website's design was made in a way to let navigation be easy and controlled, while still be nice to look at. A lot of earlier complaints, especially with the second draft, have been that the site is almost painful to look at. With the final draft we believe that we have struck the nail on its head. The site is clearly labeled and full of information about our business, it contains the in progress tickets, and a quick way to submit a ticket (A.K.A. Using our service). The Fitt's law measure we kept in mind was to put as few as possible clicks and barriers to get to submit a ticket. This is one of the reasons we removed the photos, as the requirement to send it took time away from submitting the ticket. The accessibility was manually checked by us and we used our own judgement in debating how accessible it was, as well as using feedback from our test groups to check whether or not everyone had an easy time navigating and using it.

Heuristic Evaluation

- Norman's Heuristic Evaluation
  - Usability of website
  - Interpretability of website
  - Cost of mistaken actions
- 3 Iterations - We asked users in each iteration to
  - Input a pothole into the database with a comment attached
  - Ensure that when entering the database, the report can be seen
  - Report a second pothole, without a comment this time
  - When re-entering the database, ensure both reports can be seen

For our project, we decided to use Norman's Heuristic Evaluation. It checks that a user can do three things; see and use the website, interpret how to use the website, and they can easily undo unwanted actions. In each of our iterations, we made sure that all of our users could do these three things. In our first iteration, which happened during the second design of our website, our users struggled with using and interpreting the website. Because of the design and colors, it was hard to navigate and understand where things were supposed to be located. In our second iteration, we ended up using a semi-final design of our website. Our testers found that the website was usable and interpretable, but inputting an image in the report table caused for the table to look wrong alongside other images. Therefore they could not go back and change their image to one with a nicer view. For our last iteration, we were on the final design of our website. Testers reported that the website was easily usable and interpretable due to the layout created with CSS. It allowed for easy navigation, viewing, and reporting. One thing that still cannot be done by our website is removing a previously reported pothole. We decided upon not adding this as an option because it could allow malicious users forge requests to remove potholes before they have been fixed.

Because our code does not account for this error, if a user spelled something wrong, the report would still head to the database. To hopefully fix this error in the progression of our website, we would have an automated process that would deny or approve requests based on the validity of the location and size. Since we did not have a database to actually account for those measures, we ask user to simply check their report before hitting submit to check for validity.

Overall Data from Users

- To get our final data, we created a new Google Form survey to our original 32 users.
- We know from our original survey that around half were actively commuting and 75% were interested in the idea of our website.
- Our final survey asked if they believed how the website worked now was aligned with the vision they had for it. And if they would still be interested in using the service.
- We also left an area for comments to see what intrigued people the most.

A general opinion from most users was that the GUI of the website had definitely improved from our first layout iteration which they were shown. They reported that it was definitely nicer to look at and it was simple enough to understand where everything on the website was.

65% of users said that the amount of time to report a pothole was definitely shorter and more concise than that of a government reporting website, which had alot of other information displayed and it was hidden on a website. Our same 75% of users said that they enjoyed the fact that potholes would receive more attention and be fixed in a faster time.

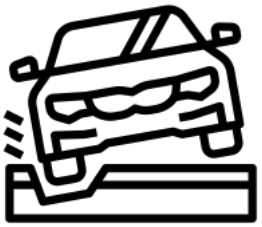
Overall, we found that our project was generally appealing to drivers due to ease of use and the shortened amount of time it would take a pothole to be fixed.

Targeted E - Revisited

- Throughout our developmental processes, we always tried to keep the submission of the ticket simple and fast, yet still detailed enough to get a proper fix out in a timely manner
- The choices we made to “beautify” the website are a decent trade off in terms of increasing the time to navigate to submit the tickets while making the process nicer to look at, overall improving the user’s experience.
- We used another survey to gauge how our users felt about the change and the results show an almost unanimous approval of the website’s graphics, and not much dismay at having to click an extra button to submit a ticket

When we first wrote about our Targeted E, the website was still in its earlier forms of production. We had not come across to the fact that we needed to fix our website to accommodate for our Targeted E, which is efficiency. From the get go, we have wanted to make sure our website and our project is as efficient as possible for users. We want our users to think “this website was very efficient, easy to use, and was fast to use” when they use Pothole Project. When we were going through our testing stages for the website, we really wanted to capture the idea of efficiency in our project. Through this testing process, we added better design elements and removed unnecessary forms and objects on the website so people using our project would have a more efficient experience. The beautified version of our website was able to help users navigate the website faster, even though they needed to click an extra submit button to submit a ticket. We made sure to test and see what users would say about our efficient design when we made any big changes, and when we beautified the website and got rid of unnecessary tasks, there was a unanimous approval of efficiency as well as a positive reaction to the websites design. Overall, we made sure that it was one of our top priorities to make sure that our website continued to become more and more efficient according to our Targeted E throughout the designing and testing process.

Future Work



- The next steps we would do for this website are
  - Host this website so the public can utilize it
  - Provide a google maps location tool to show and place where the pot hole is
  - Phone model so people can submit pothole requests on their mobile device
  - Notifications to someones email that their pothole request has been fixed/is being worked on
- We most likely will not work on this project in the future
  - Although we love this website and what this idea brings to society, future time constraints as well as money constraints will bring this project to a halt.

If we were to continue working on Project Pothole in the future, there would be quite a few things we would consider doing in the future. Firstly, we would host this website on the internet so the public could utilize this website. Currently the project is on a localhost for testing, so the public would not be able to access a city-wide database like we have planned.

After hosting the website on the internet, we would try to implement a phone app so users could easily access this project on their phones for easy use. Currently the project is only able to be used on a computer, and it might be tedious for people on the go who want to report a pothole. People could easily forget where the pothole is by the time they set up their computer and pull up the project to report a pothole. Making a phone app would provide on the go support to people who need a pothole fixed instantly.

We would implement a google maps location tool that would show where the pothole you want to be fixed is. This would make it a lot easier for users as well as construction to pinpoint exactly where the pothole is so it can be fixed accordingly and efficiently.

Finally, the last thing we can think of to implement in the future is a email and notification system. After someone submits a pothole, we would send a confirmation of the pothole they requested to fix, as well as any status updates to the pothole (including when its getting fixed, what roads are being shut down to fix this, whos fixing it, and when it should be fixed by). When a phone app gets implemented, we

would send a app notification to their phone, as well as an email.

Although our team believes that this project is well-worth our time as well as truly being implemented in the real world for everyone to use, the reality of us being able to complete this website and app would be hard to do. There would be significant money constraints for this project, considering all of us are relatively broke college students. We have created a project idea that is competing with the government, and would need to make contracts with construction workers to fill in potholes, as well as probably getting certifications so we could make this app a reality. All of this would cause in a hefty investment that we unfortunately do not have at the moment.

References

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